Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army												Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*					R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*							
COST ($ in Millions)	**Prior Years**	**FY 2022**	**FY 2023**	**FY 2024 Base**	**FY 2024 OCO**	**FY 2024 Total**	**FY 2025**	**FY 2026**	**FY 2027**	**FY 2028**	**Cost To Complete**	**Total Cost**
Total Program Element	-	10.660	15.716	18.986	-	18.986	21.027	29.173	30.082	30.432	0.000	156.076
CK9: *Advancing Concepts and Technology Forecasting Tech*	-	2.206	2.529	2.586	-	2.586	2.572	2.576	2.577	2.606	0.000	17.652
CN2: *Intelligent Weapons Concepts and Technologies*	-	2.098	3.335	4.474	-	4.474	4.475	4.481	4.484	4.524	0.000	27.871
CN9: *Soldier Enabling University Applied Research*	-	0.905	0.396	0.457	-	0.457	2.171	2.777	2.779	2.809	0.000	12.294
CO1: *Soldier Power And Energy Concepts and Technologies*	-	1.195	2.387	4.442	-	4.442	4.483	8.132	9.447	10.084	0.000	40.170
CO2: *Soldier-Intelligent Technology Research*	-	4.256	1.543	-	-	-	-	-	-	-	0.000	5.799
CV9: *Technical-SAVVY Soldier Applied Research*	-	-	2.331	3.396	-	3.396	3.657	3.767	3.350	2.883	0.000	19.384
CW9: *Syn Bio for Reactive-Resp Matls-Soldiers & Sys*	-	-	3.195	3.631	-	3.631	3.669	7.440	7.445	7.526	0.000	32.906

A. Mission Description and Budget Item Justification

This Program Element (PE) investigates, designs, and performs research focused on technologies necessary for capability enhancements for the Soldier and Squad over the long-term well beyond those technologies planned within the Soldier Lethality Cross- Functional Team. Applied research projects investigate nascent and enduring science and technology areas that are applicable to the individual Soldier and Squads of Soldiers needs with emphasis on maximizing Soldier and Squad performance, lethality, mobility and survivability. This PE also designs and validates technologies that are necessary and foundational for future capabilities with far-reaching impact on mission success. The outputs of these efforts transition to advanced research efforts that mature and demonstrate potential opportunities to realize improved Soldier performance and inform technical requirements for future Soldier systems.

The PE will fund civilian salaries for in-house researchers/scientists and program managers collaborating with external subject matter experts in academia and industry who are leaders in these technology research areas. This PE is coordinated with PE 0602143A (Soldier Lethality Technology), 0602785A (Manpower, Personnel and Training Technology), 0603007A (Manpower, Personnel and Training Advanced Tech), 0603044A (Soldier Advanced Technology), and 0603118A (Soldier Lethality Advanced Technology).

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Exhibit R-2, RDT&E Budget Item Justification: PB 2024 Army	Date: March 2023
Appropriation/Budget Activity 2040: *Research, Development, Test & Evaluation, Army* / BA 2: *Applied Research*	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*

Research in this PE is performed by the United States (US) Army Futures Command (AFC).

B. Program Change Summary ($ in Millions)	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total
Previous President's Budget	11.064	15.716	16.059	-	16.059
Current President's Budget	10.660	15.716	18.986	-	18.986
Total Adjustments	-0.404	0.000	2.927	-	2.927
• Congressional General Reductions	-	-			
• Congressional Directed Reductions	-	-			
• Congressional Rescissions	-	-			
• Congressional Adds	-	-			
• Congressional Directed Transfers	-	-			
• Reprogrammings	-0.404	-			
• SBIR/STTR Transfer	-	-			
• Adjustments to Budget Years	-	-	2.927	-	2.927

Change Summary Explanation

Funding increase in FY2024 supports additional research for Army in alternative power sources efforts.

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CK9 / *Advancing Concepts and Technology Forecasting Tech*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CK9: *Advancing Concepts and Technology Forecasting Tech*	-	2.206	2.529	2.586	-	2.586	2.572	2.576	2.577	2.606	0.000	17.652

A. Mission Description and Budget Item Justification

This Project works across the Army Futures Command Combat Capabilities Development Command (AFC CCDC) and with the Futures & Concepts Center (FCC) to explore current and future emerging and disruptive applied scientific research in order to translate, integrate, and ingrain applied research outcomes with Army Warfighting Concepts to describe how the Army will fight in the mid and far-term future. Applied research outcomes describe the projected future operational effects of science in the context of Army concepts to mitigate risk for future Army capabilities and enable informed decision making across the Army Modernization Enterprise. This Project ensures Army Concepts are grounded by recent discoveries in applied scientific research, Army applied research is capability use-inspired to deliver the right future capability identified in the Army Concepts, and learning opportunities are created to advance Army Concepts and operationalize science for transformational overmatch.

This Project also performs long-range technology forecasts and trend analysis, informed by the threat and the predicted future state of technology, of Army-relevant applied research topics to enable informed decision making for the near-, mid-, and far-terms.

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Advancing Concepts and Technology Forecasting	2.206	2.521	2.586
Description: Advancing Concepts and Technology Forecasting identifies and translates emerging and disruptive applied scientific research current and future outcomes in order to integrate and ingrain applied scientific data and knowledge with Army Warfighting Concepts which describe how the Army will fight in the mid- and far-term future. This effort also provides long-range, scientifically grounded technology forecasts and trend analysis, informed by the threat and future predicted state of technology, of applied research topics to enable informed decision-making for the near-, mid-, and far-terms.			
FY 2023 Plans: Integrate applied scientific research outcomes into emerging Army Warfighting Concept priorities for mid- and far-term decision dominance, sustained operations, and maximizing human potential; determine objective estimates of anticipated technology advances, across the Army Priority Research Areas, for Army decision-makers to aid in applied research program formulation.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CK9 / *Advancing Concepts and Technology Forecasting Tech*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will provide objective estimates of anticipated applied research advances of emerging scientific areas with high relevance to the Army. Broad technology areas include extensions to the Army Priority Research Areas and other topics such as Army-unique autonomous behaviors, cross-domain sensor modalities, and agile manufacturing technologies; integrate outcomes of mid- and far-term Army Warfighting Concept priorities for decision advantage into emerging applied scientific research programs in distributed sensing and artificial intelligence for agile command and control, and for sustained operations into emerging applied scientific research programs in energy sciences. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports the planned lifecycle of the effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.008	-
Accomplishments/Planned Programs Subtotals	2.206	2.529	2.586

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CN2 / *Intelligent Weapons Concepts and Technologies*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CN2: *Intelligent Weapons Concepts and Technologies*	-	2.098	3.335	4.474	-	4.474	4.475	4.481	4.484	4.524	0.000	27.871

A. Mission Description and Budget Item Justification

This Project focuses on far-term, overarching lethality technologies by investigating techniques for Soldiers to guide the in-field adaptation of intelligent small arms technologies to respond to changing mission requirements, novel environments, and adversarial actions. Research areas include cognition-centric displays to ensure Soldiers maintain appropriate situational awareness in augmented reality (AR) environments, opportunistic shooter sensing, and interactive machine learning techniques to ensure small arms technologies can adapt to changing situations quickly and with reduced data requirements as compared to non-human guided machine learning and Artificial Intelligence (AI). The results of this Project will enhance operational performance of individuals and teams of Soldiers in the future operational environment through novel weapon and human-agent interaction technologies.

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Human-Agent Interactions for Intelligent Squad Weapons	2.098	3.312	4.474
Description: This effort investigates enhanced target acquisition, situational awareness, and shooting performance through Soldier-centered integration of intelligent technologies and distributed information in augmented squad weapons. Enhances operational performance of individuals and teams of Soldiers through novel weapon and human-agent interaction technologies.			
FY 2023 Plans: Will determine methods for expanding prior opportunistic sensing approaches to increasingly realistic scenarios; investigate capabilities derived from fusion of opportunistically sensed data from small arms and small unmanned aerial systems; design and develop enhanced approaches for small arms fire control based on aim augmentation.			
FY 2024 Plans: Will mature algorithms for fusion of opportunistically sensed data from intelligent weapons and small unmanned aerial systems; develop adaptive small arms fire control capabilities using integrated opportunistic sensing within artificial intelligence (AI)-enhanced small arms ecosystems; develop methods for using opportunistic sensing to quantify emergent behaviors from dismounted, heterogenous human-autonomy squads during realistic scenarios; investigate approaches for providing contextualized Soldier-weapon-squad state data for enhanced squad-level task prioritization and command-level decision making.			
FY 2023 to FY 2024 Increase/Decrease Statement:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CN2 / *Intelligent Weapons Concepts and Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding realigned from PE 0602143A Project BE8 Synthetic Training Environment (STE) Technology to increase research in the areas of opportunistic sensing and squad level decision making.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.023	-
Accomplishments/Planned Programs Subtotals	2.098	3.335	4.474

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CN9 / *Soldier Enabling University Applied Research*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CN9: *Soldier Enabling University Applied Research*	-	0.905	0.396	0.457	-	0.457	2.171	2.777	2.779	2.809	0.000	12.294

A. Mission Description and Budget Item Justification

This Project investigates technologies from academia that will improve capabilities and systems to advance Soldier and Squad lethality-overmatch and Soldier performance. This Project funds collaborative, enduring applied extramural university-based research and brings together competitively selected universities with Army research teams into Technical Alliances. This Project will determine discovery solutions and inform capabilities development for mid- to far-term Army modernization priorities while also maintaining delivery of near-term technologies fundamental to the modernization priorities. The technical scope of this Project includes the investigation and design of overarching Soldier-centric technologies including, human systems integration, robotics, synthetic environments for training, advanced materials, power management, energy, Warfighter endurance, and computational technologies. This Project conducts applied research for potential emerging technologies in areas of strategic importance to the Army in Soldier capabilities related to increased protection, performance, agility, situational awareness, and lethality. This Project will also continuously strive to engage and collaborate with entities that might not otherwise collaborate with the Department of Defense (DoD) to identify and determine novel Soldier-centric technologies for accelerating the adoption of emerging technologies for the Warfighter in the Army Soldier portfolio.

Work in this Project complements Program Element 0603044A (Soldier Advanced Technology)/Project CN8 (Soldier Enabling University Advanced Development)

The work cited is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Work in this Project is performed by the United States Army Futures Command.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Soldier Training and Performance	0.622	0.382	0.457
Description: Collaboratively investigate technologies for Soldier capabilities related to increased protection, performance, agility, situational awareness, training, and lethality.			
FY 2023 Plans: Will expand investigation in common software platform the automated testing framework to guarantee that synthetic training environments are highly trustworthy, reliable, and usable, to ensure that Soldiers are efficiently trained; investigate cognitive state and readiness of Warfighters through digital biomarkers and biosensors.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CN9 / *Soldier Enabling University Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Collect, label, warehouse, and analyze training data for the development of synthetic training environment. Continue to investigates technologies to monitor health, cognitive state and readiness of Warfighters through digital biosensor/biomarkers and their wireless charging capabilities. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase reflects planned lifecycle increase to expand the technology investigation and user feedback.			
Title: Soldier Electronics for the Integrated Combat Platform ***Description:*** Design and determine advanced materials and electronics that are standardized to the Soldier and their equipment through integrated combat platform.	0.283	-	-
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638. ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638.	-	0.014	-
Accomplishments/Planned Programs Subtotals	0.905	0.396	0.457

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CO1 / *Soldier Power And Energy Concepts and Technologies*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CO1: *Soldier Power And Energy Concepts and Technologies*	-	1.195	2.387	4.442	-	4.442	4.483	8.132	9.447	10.084	0.000	40.170

A. Mission Description and Budget Item Justification

This Project conducts applied research to improve safe, compact, efficient, rugged, lightweight, and energy dense power sources for increased capabilities for the mounted and dismounted force. This Project also investigates materials, processes, and component level energy storage and conversion technologies that enable tactical overmatch and reduce the physical and cognitive burden on Soldiers. Research will focus on safe electrochemical energy storage, high specific energy storage and conversion, novel materials and processing for energy and power, and new cell designs that address the power needs of future capabilities including advanced sensors, communications systems, and electronic Warfighting capabilities. Enabling and emerging technologies are supported in this Project to address future Soldier power needs necessary for increased lethality, increased mobility, and longer mission durations at reduced physical burden to the Soldier in the future operating environment.

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Tactical Energy Sources and Energy Materials	1.195	2.384	2.442
Description: This effort conducts overarching power and energy research to determine and design alternative energy capabilities to replace current energy systems. Research focuses on new materials and processing techniques as well as energy storage technologies that support advanced sensors, communications systems, and electronic Warfighting capabilities.			
FY 2023 Plans: Investigate anode protection schemes for high capacity and high charge rate anode materials to enable high energy, safe, non-flammable aqueous electrolyte batteries; identify processes and methods to scale materials and component fabrication to larger format and multilayer pouch cells; investigate high energy cathodes including halide intercalation and conversion cathodes; develop protective interphases at the electrode/electrolyte interfaces to enable selective transport in aqueous electrolytes for reversible lithium (Li), zinc (Zn), and multivalent rechargeable batteries; validate and asses key metrics related to energy density, cycle life, columbic and cycle efficiency, rate capability, and safety of rechargeable batteries; design and generate catalysts and perform modelling with atomic precision to gain an accurate understanding of the fundamental factors dictating carbon dioxide reduction reaction mechanisms and conversion product selectivity; determine the most impactful fuels for synthesis from carbon			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CO1 / *Soldier Power And Energy Concepts and Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
dioxide; investigate the use of stretchable power devices with textile-woven conductors for a full body power management system with integrated data communication. ***FY 2024 Plans:*** Will characterize nickel and nickel-based alloy catalyst parameters for ethanol partial oxidation; investigate alumina and ceria-based materials as support substrate for ethanol partial oxidation catalysts; design and develop baseline characterization methods to explore catalyst and catalyst support combinations for the reduction of ethanol reformation temperature; design and develop large area, high capacity rechargeable batteries utilizing aqueous, hybrid, and inorganic electrolytes and additives; determine temperature driven phase and transport behavior in aqueous, hybrid, and inorganic electrolytes and investigate conductivity, transference number, capacity, recharge rate, and cycle life at high and low temperatures; investigate incorporation of high energy anodes for rechargeable aqueous batteries including silicon, metal, and alloy chemistries; identify routes to synthetically protect and passivate from electrolyte decomposition at high energy anodes; design and develop binders and methods for scalable processing and integration of battery material; mature high capacity halide-based cathode and supporting electrolyte interface. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports the planned lifecycle of this effort.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.003	-
Title: Materials and Technologies for Electrochemical Alternative Power ***Description:*** This effort investigates materials for electrolyzers and alternative power sources for small unit energy and power needs. Research is focused on materials and technologies that will reduce the dependence on fossil fuels while diversifying the energy sources for soldier platforms. ***FY 2024 Plans:*** Will investigate electrocatalysts and membranes for open cell electrolysis; perform analysis on candidate fuel products and associated production rates constrained by size, weight, and power and reduced carbon footprint; design and develop the button cell fabrication process for electrochemical alternative power sources. ***FY 2023 to FY 2024 Increase/Decrease Statement:***	-	-	2.000

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CO1 / *Soldier Power And Energy Concepts and Technologies*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Funding increase supports additional research in alternative power sources.			
Accomplishments/Planned Programs Subtotals	1.195	2.387	4.442

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CO2 / *Soldier-Intelligent Technology Research*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CO2: *Soldier-Intelligent Technology Research*	-	4.256	1.543	-	-	-	-	-	-	-	0.000	5.799

A. Mission Description and Budget Item Justification

This Project investigates research gaps related to human and intelligent systems to enhance decision making in response to changing conditions. Applied research is conducted on novel and emerging visualization technologies as well as methodologies for intelligent systems and Soldier to co-adapt for the real-time quantification, prediction, and enhancement of squad-level shared situational awareness (SA) and situational understanding (SU) across dynamic, complex, and uncertain operating environments, leading to demonstrated increases in mission effectiveness. The result of this Project will inform various efforts that rely on human and intelligent system interactions including systems that adapt the behavior of autonomous assets and intelligent Soldier tools, based on dynamic needs of the Soldier/squad, using real-time opportunistic measures of Soldier SA and changing mission environment. In addition, this Project will design novel approaches to represent uncertain and dynamically changing information, to increase Soldier comprehension and enhanced mission effectiveness, with reduced Soldier/squad burden and training requirements.

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Soldier Performance in Sociotechnical Environments	2.872	1.504	-
Description: Technologies for squad-level situational awareness assessment (information visualization) that provide command-level decision support with communication and intervention capabilities. Research focuses on algorithms for the quantification and visualization of collective uncertainty at the squad level for mission command decision making. This effort also supports the monitoring and assessing of Soldier tactical readiness and effectiveness through technologies and approaches for opportunistic human sensing. ***FY 2023 Plans:*** Will develop algorithms for autonomous systems to use opportunistically sensed data from groups in dismount virtual environments to adapt a learned behavior, or set of behaviors, for improved squad-autonomy performance. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Decreased funding due to effort being completed in FY23			
Title: Algorithms for Sensing Soldiers in Mission Context	1.384	-	-
Description: This effort investigates novel and emerging visualization technologies representing complex, time-sensitive information in the dynamic operating environment as well as technologies for human and artificial intelligence (AI) situational			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CO2 / *Soldier-Intelligent Technology Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
understanding for enhanced operational performance and decision making under conditions of time sensitive and dynamically changing information.			
Title: SBIR/STTR Transfer ***Description:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.039	-
Accomplishments/Planned Programs Subtotals	4.256	1.543	-

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CV9 / *Technical-SAVVY Soldier Applied Research*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CV9: *Technical-SAVVY Soldier Applied Research*	-	-	2.331	3.396	-	3.396	3.657	3.767	3.350	2.883	0.000	19.384

A. Mission Description and Budget Item Justification

This Project conducts applied research to provide critical breakthroughs in developing a "technologically" fluent force. This research will develop models of technological fluency(TF) (TF Modeling), methods and measures to assess and develop the technological fluency of Soldiers across a career (TF Personnel Assessments), and technologies to maximize technological fluency resilience and performance in Soldiers and units (Maximizing TF). TF is defined as the ability of Soldiers and units to use and rapidly adapt new and intelligent technologies without formal training on these technologies, and it will be a decisive factor in a future operating environment in which Soldiers and squads are teamed with increasingly sophisticated and evolving technologies. Soldiers and leaders in specialty areas (e.g., Cyber and Emerging Tech) and General Purpose Forces will require increased technological aptitudes and skills to adapt emerging technologies to evolving mission sets and avoid being overmatched by Artificial Intelligence (AI)-enabled "smart" technologies.

This Project supports key Army needs and will coordinate with and/or leverage findings of several Program Elements (PEs) to include PE 0602785A (Manpower, Personnel and Training Technology), 0602143A (Soldier Lethality Technology), and 0602145A (Next Generation Combat Vehicle Technology).

This research will be performed collaboratively by the Combat Capability Development Command - Army Research Laboratory (ARL) and the United States (U.S.) Army Research Institute (ARI) for Behavioral and Social Sciences.

The cited research is consistent with the Under Secretary of Defense for Research and Engineering priority focus areas, the Army Modernization Strategy, and the Army People Strategy.

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Soldier Technical Enhancement Applied Research - ARL	-	1.497	2.096
Description: This effort enables TF through three areas of focus: TF Modeling through the creation and utilization of novel future-focused experimental test-beds; TF Personnel Assessments through methodologies and technologies for "opportunistic" (no Soldier burden) sensing and TF interpretation; and Maximizing TF through creating TF training approaches and in-field performance aids.			
FY 2023 Plans: Design the first of its kind future human-system interaction experimental environment containing multiple research grade test-beds; design and pilot initial experimental methodologies in support of TF Modeling.			
FY 2024 Plans:			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CV9 / *Technical-SAVVY Soldier Applied Research*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Will mature human-system interaction experimental environment to include prototype adaptive intelligent system interactions and initial technology integration for opportunistic sensing capability; conduct validation experiments on initial TF models using human-system interaction test-beds. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports planned increase in test bed development research.			
Title: Soldier Technical Enhancement Applied Research - ARI ***Description:*** This effort enables TF through three areas of focus: TF Modeling by identifying and understanding the critical human knowledge, skills, abilities, and characteristics that enable TF in Soldiers and teams; TF Personnel Assessments by developing and validating personnel tests to assess knowledge, skills, and abilities, and characteristics to promote TF for talent management; and Maximizing TF by creating and validating TF training approaches to improve TF at both the individual and team levels of performance. ***FY 2023 Plans:*** Develop a competency model of Technological Fluency (TF) that identifies the critical knowledge, skills, abilities, and characteristics that enable TF and related elements of job performance. ***FY 2024 Plans:*** Will continue to develop a competency model of Technological Fluency (TF) that identifies the critical knowledge, skills, abilities, and characteristics that enable TF; will initiate development of proof-of-concept training methods for maximizing TF competencies; will develop and define the individual personnel testing requirements needed to measure TF model competencies. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports planned lifecycle of the effort.	-	0.749	1.300
Title: SBIR/STTR Transfer ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.085	-
Accomplishments/Planned Programs Subtotals	-	2.331	3.396

C. Other Program Funding Summary ($ in Millions)

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CV9 / *Technical-SAVVY Soldier Applied Research*

C. Other Program Funding Summary ($ in Millions)

Remarks

D. Acquisition Strategy

N/A

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army			Date: March 2023
Appropriation/Budget Activity 2040 / 2	R-1 Program Element (Number/Name) PE 0602184A / *Soldier Applied Research*	Project (Number/Name) CW9 / *Syn Bio for Reactive-Resp Matls-Soldiers & Sys*	

COST ($ in Millions)	Prior Years	FY 2022	FY 2023	FY 2024 Base	FY 2024 OCO	FY 2024 Total	FY 2025	FY 2026	FY 2027	FY 2028	Cost To Complete	Total Cost
CW9: *Syn Bio for Reactive-Resp Matls-Soldiers & Sys*	-	-	3.195	3.631	-	3.631	3.669	7.440	7.445	7.526	0.000	32.906

A. Mission Description and Budget Item Justification

This Project designs and investigates materials through the application of biotechnology and synthetic biology advances to develop material capabilities that respond and/or can adapt to a wide range of external stimuli and biological processes. Research into innovative materials that are capable of sensing, responding, and adapting to a broad spectrum of environmental variables will be conducted. This Project will explore new biology-based methods for controlled synthesis and assembly to create multi-functional materials and advanced composites as well as develop materials that are able to self-monitor, self-heal, and self-sustain. This Project also focuses on developing models, materials characterization techniques, non-destructive testing methods, and advanced fabrication and processing methodologies as well as the identification of unique material properties.

The cited research is consistent with the Undersecretary of Defense for Research and Engineering priority focus areas and the Army Modernization Strategy.

Research in this Project is performed by the United States Army Futures Command (AFC).

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
Title: Biological Bio-Composite Materials and Processes	-	3.078	3.631
Description: This effort conducts applied research through the application of biotechnology advances to develop materials with capabilities to respond and adapt to a wide range of external stimuli and biological processes. Research will explore new biology-based methods for controlled synthesis and assembly to create materials with precise chemistries, microstructures, properties, and responsive functionalities through controlled molecular placement, spatial architectures, and interfacial structures. Investment in bio-enabled materials research allows for the design of materials that are capable of sensing and responding, as well as adapting to a broad spectrum of environmental variables with the ability to self-monitor, self-heal, self-sustain, and self-degrade. Investments in this area could lead to future applications in Soldier performance, situational awareness, protection, and sustainment.			
FY 2023 Plans: Design and develop biological building blocks to interface with sensor platforms and investigate signal transfer to platform; develop a library of tunable and modular biological building blocks for advance sensing (e.g., Soldier performance, situational awareness, and target tracking and locating); develop hybrid experimental and computational tools to inform design of novel biomaterials for control in the electro-optical/electromagnetic (EO/EM); assess novel adhesive molecules and structural composites for scale and integration for down-stream processing (e.g. energetics, protective coatings); determine utility of novel biomaterials for advanced composites and protective coatings; investigate rate of degradation of high value targets and validate			

Exhibit R-2A, RDT&E Project Justification: PB 2024 Army		Date: March 2023
Appropriation/Budget Activity 2040 / 2	**R-1 Program Element (Number/Name)** PE 0602184A / *Soldier Applied Research*	**Project (Number/Name)** CW9 / *Syn Bio for Reactive-Resp Matls-Soldiers & Sys*

B. Accomplishments/Planned Programs ($ in Millions)	FY 2022	FY 2023	FY 2024
down-selected models of accelerated degradation using laboratory experiments; design biological counter measures to prevent or mitigate material degradation and investigate dynamic range of degradation processes. ***FY 2024 Plans:*** Will design and develop biological building blocks to interface with military equipment, electronics, and platforms (i.e. coatings, textiles, metals) for advance sensing, protection, and deception, and investigate signal output for sensors; investigate and tune novel biomaterials for control in electro-optical/electromagnetic (EO/EM) and determine shielding for protection; continue to tune and assess novel structural composites for scale and integration for down-stream processing (e.g. energetics, protective coatings); investigate strategies to integrate biomaterials into composites for protection, situational awareness, and communication to determine utility of novel biomaterials for advanced composites and protective coatings; understand biodegradation mechanisms of protective coatings and identify strategies to tune effects and delivery mechanisms. ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding increase supports additional research into novel biomaterials.			
Title: SBIR/STTR Transfer ***FY 2023 Plans:*** Funding transferred in accordance with Title 15 USC §638 ***FY 2023 to FY 2024 Increase/Decrease Statement:*** Funding transferred in accordance with Title 15 USC §638	-	0.117	-
Accomplishments/Planned Programs Subtotals	-	3.195	3.631

C. Other Program Funding Summary ($ in Millions)

N/A

Remarks

D. Acquisition Strategy

N/A